Etiology of Infectious Conjunctivitis in Children: A Multi-Center Case-Controlled Study

Holly M Frost[1,2]; Thresia Sebastian[1,2]; Timothy C Jenkins[1,2], Amy Keith[1]; Melanie Kurtz[1]; Jennifer Meece[3], Samuel Dominguez[2,4], Connie-Savor Price[1,2]

BACKGROUND:

Acute infectious conjunctivitis (AIC) is a common pediatric infection affecting **one in eight children** annually. The etiology of AIC is poorly understood but important to inform treatment and return to school recommendations. Additionally, the association of bacteria isolated from the conjunctiva with the development of clinical AIC is not well defined.

OBJECTIVE:

To determine the bacterial and viral causes of AIC in children.

METHODS:

- Children 6 months-18 years of age with AIC and age-matched healthy controls and upper respiratory tract infection (URI) controls were enrolled.
- Patients were enrolled in primary care and urgent care settings at Denver Health (Denver, CO) and Marshfield Clinic (Marshfield, WI) between 2019 and 2021.
- Conjunctival flocked swabs (Eswab®, Copan Diagnostics) were obtained from all patients.
- Nucleic acids were extracted using the NucliSENS® easyMAG® system (Quidel, San Diego, CA).
- Multiplex RT-PCR for *S.pneumoniae, H.influenzae, M.catarrhalis, S.aureus* and 11 respiratory viruses (including SARS-CoV-2) was completed using Lyra® (Quidel, San Diego, CA) and AnDiaTec® assay kits (Quidel Germany GmbH, Kornwestheim, Germany).
- Nucleic acid amplification and detection were completed on the Applied Biosystems® (ABI) 7500 Fast Dx RT- PCR Instrument.
- Odds ratios and 95% confidence intervals were computed for each organism.

H.influenzae was the most frequently identified pathogen and had the strongest association with infectious conjunctivitis compared to controls.

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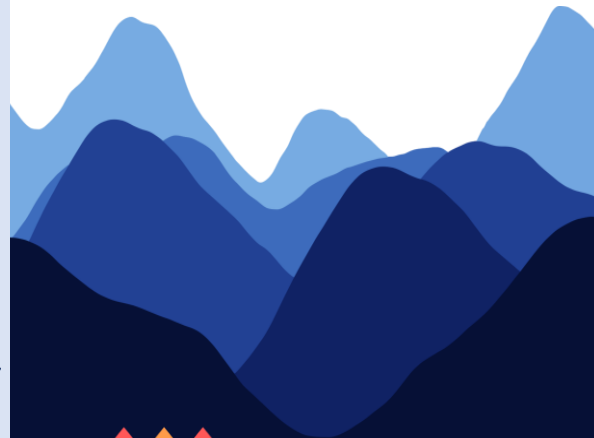
✉ holly.frost@dhha.org

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RESULTS:

- 149 patients (78 cases and 71 controls) were enrolled.
- Bacteria were detected in 59 (75.6%) cases and 36 (50.7%) controls (OR 14.3; 4.7, 33.7).
- Respiratory viruses were infrequently detected (2 cases (2.6%); 6 controls (8.5%)), including in the pre-pandemic period.
- Of bacteria detected in cases, *H.influenzae* was the most common (56.4%) and had the highest association with conjunctivitis (OR 11.8; 4.8, 29.1).
- The second most common organism was *M.catarrhalis* (35.9% of cases; OR 2.5; 1.2, 5.3).
- *S.pneumoniae* was detected more often in controls than in cases (33.8% v 26.9%).

CONCLUSIONS:

H.Influenzae is the pathogen most strongly associated with AIC in children. Viruses, including SARS-CoV-2 and adenovirus, were infrequently identified. Though data have suggested marginal benefit of antibiotic treatment for conjunctivitis overall, **future studies specifically looking at the benefit of ophthalmic antibiotics by organism would advance the field**.

TABLE: Bacteria and viruses detected in children with AIC and controls

Organism	Cases	Controls			OR (95% CI)[a]
	N (%) N= 78	Healthy N (%) N= 33	URI[b] N (%) N= 38	Total N (%) N= 71	
S.pneumoniae[c]	21 (26.9)	11 (33.3)	13 (34.2)	24 (33.8)	0.7 (0.4, 1.5)
H.influenzae[c]	44 (56.4)	2 (6.06)	5 (13.1)	7 (9.86)	11.8 (4.8, 29.1)
M.catarrhalis[c]	28 (35.9)	4 (12.1)	9 (23.7)	13 (18.3)	2.5 (1.2, 5.3)
S.aureus[c]	13 (16.7)	4 (12.1)	3 (7.89)	7 (9.86)	1.8 (0.7, 4.9)
Any bacteria	59 (75.6)	17 (51.5)	19 (50.0)	36 (50.7)	14.3 (4.7, 43.7)
Polymicrobial	35 (44.9)	3 (9.09)	8 (21.0)	11 (15.5)	1.6 (0.8, 3.1)
Adenovirus[c]	1 (1.28)	1 (3.03)	0 (0)	1 (1.41)	
SARS-CoV-2[c]	1 (1.28)	0 (0)	1 (2.63)	1 (1.41)	
Other respiratory virus(es)[c,d]	0 (0)	1 (3.03)	3 (7.89)	4 (5.63)	

[a] odds ratio and 95% confidence interval between cases and total controls

[b] upper respiratory infection without conjunctivitis

[c] alone or in addition to other pathogens

[d] other respiratory viruses detected included 2 respiratory syncytial virus and 2 human metapneumovirus

[1]Denver Health and Hospital Authority, [2]University of Colorado School of Medicine, [3]Marshfield Clinical Research Institute, [4]Children's Hospital Colorado